TITLE OF THE INVENTION

IMAGE FORMING APPARATUS

BACKGROUND OF THE INVENTION

The present invention relates to an image forming

5   apparatus such as an electronic copying machine, and

more particularly to an image forming apparatus for

forming an image by performing rotation and compression

processing.

Conventionally, as the basic operation for

10   effecting rotation and compression of image data,

rotation processing is conducted with respect to

a block consisting of n pixels $\times$ n pixels, and

compression processing is thereafter carried out with

respect to the rotated image data. This is performed

15   to all the blocks of the image data.

In such a method, however, all bits of the image

data must be retrieved twice for the rotation process-

ing and the compression processing, respectively. This

leads to a problem that the rotation and compression

20   processing cannot be performed at high speed.

BRIEF SUMMARY OF THE INVENTION

It is an object of the present invention to

provide an image forming apparatus capable of

increasing the speed of the rotation and compression

25   processing of the image data.

To achieve this aim, according to the present

invention, there is provided an image forming apparatus

comprising: first storing means for storing image data;

judging means for dividing the image data stored in the

first storing means into a plurality of blocks and

making judgment upon whether all pixels are white in

5 accordance with each of the divided blocks; rotation

processing means for performing rotation processing of

image data of a block when it is determined that not

all pixels in the block are white by the judging means;

controlling means for controlling to omit rotation

10 processing of image data of a block when it is

determined that all pixels are white in the block by

the judging means; compressing means for compressing

image data of a block which skips rotation processing

by the controlling means or image data of a block

15 subjected to rotation processing by the rotation

processing means and determining resulting data as code

data; and second storing means for storing the code

data compressed by the compressing means.

According to the present invention, there is

20 provided an image forming apparatus comprising: first

storing means for storing image data; judging means for

dividing the image data stored in the first storing

means into a plurality of blocks and making judgment

upon whether all pixels are white in accordance with

25 each of the divided blocks; rotation processing means

for performing rotation processing of image data of a

block when it is determined that not all pixels in the

block are white by the judging means; second storing

means for storing image data of a block subjected to

rotation processing by the rotation processing means;

controlling means for controlling to omit rotation

5   processing of image data of a block when it is

determined that all pixels in the block are white by

the judging means; compressing means for compressing

image data of a block which skips rotation processing

by the controlling means or image data of a block

10   stored in the second storing means and determining

resulting data as code data; and third storing means

for storing the code data compressed by the compressing

means.

According to the present invention, there is

15   provided an image forming apparatus which has

compressing means for compressing image data and forms

an image, the image forming apparatus comprising: first

storing means for storing image data; judging means for

dividing image data stored in the first storing means

20   into a plurality of blocks, performing bit retrieval in

accordance with each of the divided blocks, and making

judgment upon whether all pixels of each of the blocks

are white; rotation processing means for performing

rotation processing of image data of a block which is

25   determined that not all pixels thereof are white by the

judging means; second storing means for storing image

data of a block subjected to rotation processing by the

rotation processing means; first controlling means for performing bit retrieval of image data of a block stored in the second storing means, compressing the image data by the compressing means, and determining resulting data as code data; second controlling means for compressing by the compressing means image data of a block determined that all pixels thereof are white by the judging means, and determining resulting data as code data; and third storing means for storing the code data controlled and compressed by the first controlling means or the code data controlled and compressed by the second controlling means.

BRIEF DESCRIPTION OF SEVERAL VIEWS OF THE DRAWING

FIG. 1 is a cross-sectional view schematically showing an internal structure of a digital copying machine according to an image forming apparatus of the present invention;

FIG. 2 is a block diagram schematically showing a flow of a signal for electrical connection and control of the digital copying machine depicted in FIG. 1;

FIG. 3 is a block diagram showing a structure of a primary part according to the present invention in a main control portion;

FIG. 4 is a view showing a procedure for creating code data from image data stored in a page memory;

FIG. 5 is a view illustrating rotation processing;

FIG. 6 is a flowchart for illustrating the

operation of the rotation processing and compression processing;

FIG. 7 is a flowchart for illustrating the detailed operation of the rotation processing in the case of a non-white block;

FIG. 8 is a view showing a flow of image data in the case of a non-white block; and

FIG. 9 is a view showing a flow of image data in case of a white block.

DETAILED DESCRIPTION OF THE INVENTION

An embodiment according to the present invention will now be described with reference to the accompanying drawings.

FIG. 1 is a cross-sectional view showing an internal structure of a digital copying machine (DPPC) according to an image forming apparatus of the present invention.

As shown in FIG. 1, the digital copying machine is provided with an apparatus main body 10, and a scanner portion 4 functioning as an image reader and a printer portion 6 serving as image forming means are provided in the apparatus main body 10.

An original mount base 12 consisting of transparent glass on which a reading target, i.e., an original D is mounted is provided on the top surface of the apparatus main body 10. Further, an automatic original feeder 7 (which will be referred to as an ADF

hereinafter) for automatically feeding an original onto the original mount base 12 is provided on the top surface of the apparatus main body 10. This ADF 7 is provided so as to be capable of opening and closing with respect to the original mount base 12, and functions as an original presser which presses the original D mounted on the original mount base 12 against the original mount base 12.

The ADF 7 includes: an original tray 8 in which the original D is set; an empty sensor 9 for detecting existence/absence of the original; a pickup roller 14 for taking out the originals from the original tray 8 one by one; a paper feed roller 15 for carrying the original taken out; a pair of aligning rollers for aligning the end of the original; and a carrying belt 18 arranged so as to cover substantially the entire original mount base 12. Furthermore, a plurality of pieces of the original set in the original tray 8 upwards are sequentially taken out beginning from the lowermost page, i.e., the final page and aligned by a pair of the aligning rollers 16. Thereafter, they are carried to a predetermined position of the original mount base 12 by the carrying belt 18.

In the ADF 7, a reversal roller 20, a non-reversal sensor 21, a flapper 22 and a paper ejection roller 23 are arranged at the end opposed to a pair of aligning rollers 16 with the carrying belt 18 therebetween. The

original D whose image information read by the later-described scanner portion 4 is fed out from the top of the original mount base 12 by the carrying belt 18 and ejected onto an original ejection portion 24 on the top surface of the ADF 7 through the reversal roller 20, the flapper 21 and the paper ejection roller 22. In the case of reading the back side of the original D, by switching the flapper 22, the original D carried by the carrying belt 18 is reversed by the reversal roller 20 and then supplied to a predetermined position on the original mount base 12 by the carrying belt 18 again.

The scanner portion 4 provided in the apparatus main body 10 has an exposure lamp 25 as a light source for illuminating the original D mounted on the original mount base 12, and a first mirror 26 for deflecting a reflected light from the original D in a predetermined direction. The exposure lamp 25 and the first mirror 26 are attached to a first carriage 27 arranged below the original mount base 12.

The first carriage 27 is arranged so as to be capable of moving in parallel with the original mount base 12, and reciprocated under the original mount base 12 by a non-illustrated scanning motor through a non-illustrated toothed belt and the like.

In addition, a second carriage 28 capable of moving in parallel with the original mount base 12 is provided below the original mount base 12. Second and

third mirrors 30 and 31 for sequentially deflecting
the reflected light from the original D which has been
deflected by the first mirror 26 are attached to
the second carriage 28 at right angles. The second
5   carriage 28 is caused to follow the operation of the
first carriage 27 by the toothed belt and the like for
driving the first carriage 27, and is moved in parallel
with the first carriage along the original mount base
12 at 1/2 the speed.

10   Additionally, an imaging forming lens 32 for
converging the reflected light from the third mirror 31
on the second carriage 28 and a CCD (charge coupled
device) 34 for receiving the reflected light converged
by the image forming lens and photoelectrically-
15   transferring the received light are provided below the
original mount base 12. The image forming lens 32 is
provided within a plane including an optical axis of
the light deflected by the third mirror 31 so as to
be capable of moving through a driving mechanism and
20   forms an image of the reflected light with a desired
magnification by moving by itself. Further, the CCD
34 photoelectrically-transfers the reflected light
incident thereupon and outputs an electrical signal
according to the read original D.

25   On the other hand, the printer portion 6 is
provided with a laser exposure device 40 serving as
latent image forming means. The laser exposure device

40 includes: a semiconductor laser 41 as a light
source; a polygon mirror 36 as a scanning member for
continuously deflecting a laser beam outgoing from
the semiconductor laser 41; a polygon motor 37 as

5   a scanning motor for driving to rotate the polygon
mirror 36 with a predetermined number of revolutions;
and an optical system 42 for deflecting the laser
beam from the polygon mirror 36 and leading it to a
photosensitive drum 44 which will be described later.

10   The laser exposure device 40 having such a structure is
fixed to and supported by a non-illustrated support
frame of the apparatus main body 10.

The semiconductor laser 41 is controlled to be
turned on/off in accordance with image information

15   of the original D read by the scanner portion 4 or
document information and the like transmitted/received
by a facsimile. The laser beam is directed to the
photosensitive drum 44 through the polygon mirror 36
and the optical system 42 and scans the peripheral

20   surface of the photosensitive drum 44, thereby forming
an electrostatic latent image on the peripheral surface
of the photosensitive drum 44.

Furthermore, the printer portion 6 has the
rotatable photosensitive drum 44 as an image carrier

25   which is provided at substantially the center of the
apparatus main body 10, and the peripheral surface of
the photosensitive drum 44 is exposed by the laser beam

from the laser exposure device 40, thereby forming
a desired electrostatic latent image. Around the
photosensitive drum 44 are sequentially arranged an
electrostatic charger 45 for charging the peripheral
surface of the drum to a predetermined charge, a
developer 46 which supplies toner as a developing
agent to the electrostatic latent image formed on the
peripheral surface of the photosensitive drum 44 and
develops at the desired image density, a transfer
charger 48 which integrally has a release charger 47
for separating a transferred material, i.e., copy paper
P from the photosensitive drum 44 and transfers a toner
image formed on the photosensitive drum 44 onto the
paper P, a release claw 49 for releasing the copy paper
P from the peripheral surface of the photosensitive
drum 44, a cleaning device 50 for cleaning the toner
remaining on the peripheral surface of the photosen-
sitive drum 44, and a charge eliminator 51 for
eliminating the electric charge on the peripheral
surface of the photosensitive drum 44.

An upper cassette 52, a middle cassette 53 and
a lower cassette 54 which can be pulled out from the
apparatus main body respectively are provided on the
lower portion in the apparatus main body 10 in a
vertically-ordered manner, and copy paper sheets of
different sizes are loaded in the respective cassettes.
A high-volume feeder 55 is provided on the side of

these cassettes, and approximately 300 sheets of copy
paper P of a frequently used size, for example the copy
paper P of the A4 size are accommodated in the high-
volume feeder 55. Furthermore, a paper feed cassette
57 which also serves as a manual feed tray 56 is
detachably mounted on the upper portion of the high-
volume feeder 55.

A carrying path 58 extending through a transfer
portion positioned between the photosensitive drum 44
and the transfer charger 48 from each cassette and the
high-volume feeder 55 is formed in the apparatus main
body 10, and a fixer 60 having a fixing lamp 60a is
provided at the tail end of the carrying path 58.
A discharge port 61 is formed at the side wall of the
apparatus main body 10 opposed to the fixer 60, and
a finisher 150 of a single tray is attached to the
discharge port 61.

Each pickup roller 63 which takes out the paper P
one by one from the cassette or the high-volume feeder
is provided in the vicinity of the upper cassette 52,
the middle cassette 53, the lower cassette 54 and the
paper feed cassette 57 and in the vicinity of the high-
volume feeder 51. Further, a plurality of pairs of
paper feed rollers 64 for carrying the copy paper P
taken out by the pickup roller 63 through the carrying
path 58 are provided on the carrying path 58.

In the carrying path 58, a pair of resist rollers

65 are provided on the upstream side of the photosensitive drum 44. The pair of the resist rollers 65 correct the inclination of the copy paper P taken out, align the end of the toner image on the photosensitive

5 drum 44 with the end of the copy paper P, and feed the copy paper P to the transfer portion at the same speed as the moving speed of the peripheral surface of the photosensitive drum 44. A pre-alignment sensor 66 for detecting reach of the copy paper P is provided in

10 front of a pair of resist rollers 65, namely, on the paper feed roller 64 side.

The copy paper P taken out one by one from each cassette or the high-volume feeder 55 by the pickup rollers 63 is supplied to the pair of the resist

15 rollers 65 by a pair of paper feed rollers 64. Subsequently, after the end of the copy paper P is aligned by a pair of resist rollers 65, the copy paper P is supplied to the transfer portion.

In the transfer portion, a developer image formed

20 on the photosensitive drum 44, i.e., a toner image is transferred onto the paper P by the transfer charger 48. The copy paper P on which the toner image is transferred is released from the peripheral surface of the photosensitive drum 44 by the action of the release

25 charge 47 and the release claw 49 and carried to the fixer 60 through the carrying belt 67 constituting a part of the carrying path 58. Then, after the

developer image is melted and fixed on the copy paper
P by the fixer 60, the copy paper P is ejected onto
the finisher 150 through the discharge port 61 by a
pair of paper feed rollers 68 and a pair of paper eject

5   rollers 69.

An automatic double-side device 70 for reversing
the copy paper P which has passed through the fixer 60
and again feeding it to a pair of the resist rollers 65
is provided below the carrying path 58. The automatic

10   double-side device 70 includes: a temporary accumula-
tion portion 71 for temporarily accumulating the copy
paper P; a reversal path 72 which branches from the
carrying path 58, reverses the copy paper P which has
passed through the fixer 60 and leads it to the

15   temporary accumulation portion 71; a pickup roller 73
for taking out pieces of copy paper P accumulated in
the temporary accumulation portion one by one; and
a paper feed roller 75 for feeding the taken-out paper
to a pair of resist rollers 65 through the carrying

20   path 74. Furthermore, a distribution gate 76 for
selectively distributing the copy paper P to the
discharge port 61 or a reversal path 72 is provided at
a branch point of the carrying path 58 and the reversal
path 72.

25   In the case of performing double-sided copying,
the copy paper P which has passed through the fixer
60 is led to the reversal path 72 by the distribution

gate 76 and temporarily accumulated in the temporary

accumulation portion 71 in the reversed state.

Thereafter, the copy paper P is fed to the resist

rollers 65 through the carrying path 74 by the pickup

5   rollers 73 and a pair of the paper feed rollers 75.

Then, the copy paper P is aligned by the resist rollers

65 and thereafter fed to the transfer portion again.

Moreover, a toner image is transferred onto the back

side of the copy paper P. Thereafter, the copy paper P

10   is ejected to the finisher 150 through the carrying

path 58, the fixer 60 and the paper eject roller 69.

The finisher 150 staples and rolls up each copy of

ejected document. Every time a sheet of the copy paper

P to be stapled, is ejected from the discharge port 61,

15   the paper copy P is moved to the side where it is

stapled, and then aligned by a guide bar 151. When all

the sheets of the copy paper P are ejected, a paper

pressing arm 152 presses the ejected copy paper P in

units of each copy, and a stapler unit (not shown)

20   staples the copy paper P. Thereafter, a guide bar 151

moves down, and the stapled copy paper P is ejected

in units of each copy to a finisher ejection tray 154

by a finisher ejection roller 155. An amount of

downward movement of the finisher ejection tray 154

25   is determined to some degree by the number of sheets

of the copy paper P to be ejected, and the finisher

ejection tray 154 moves down in incremental steps every

time each copy of the copy paper P is ejected. In addition, the guide bar 151 for aligning the copy paper P to be ejected is positioned at a high position such that it is not brought into contact with the stapled copy paper P mounted on the finisher ejection tray 154.

Additionally, the finisher ejection tray 154 is connected to a shift mechanism (not shown) which shifts (for example, in four directions of front, back, right and left) in accordance with each copy in the sort mode.

FIG. 2 is a block diagram schematically showing a flow of a signal for electrical connection and control of the digital copying machine illustrated in FIG. 1. As shown in FIG. 2, in the digital copying machine, three CPUs, i.e., a main CPU 91 in a main control portion 90, a scanner CPU 100 in the scanner portion 4 and a printer CPU 110 in the printer portion 6 are constituted. The main CPU 91 performs bi-directional communication with the printer CPU 110 through a shared RAM 95, the main CPU 91 only issues operational commands, and the printer CPU 110 returns the statuses. The printer CPU 110 and the scanner CPU 100 carry out serial communication, the printer CPU 110 issues the operational commands, and the scanner CPU 100 returns the statuses.

An operation panel 80 is connected to the main CPU 91.

The main control portion 90 is constituted by the main CPU 91, a ROM 92, a RAM 93, an NVM 94, the shared RAM 95, an image processing portion 96, a page memory control portion 97, a page memory 98, a printer

5   controller 99, and a printer font ROM 121.

The main CPU 91 controls the entire main control portion 90. The ROM 92 stores therein a control program. The RAM 93 temporarily stores data.

An NVM (endurable random-access memory:

10   nonvolatile RAM) 94 is a nonvolatile memory backed up by a battery (not shown), and data on the NVM 94 is held when the power supply is turned off.

The shared RAM 95 is used for performing bi-directional communication between the main CPU 91

15   and the printer CPU 110.

The page memory controller 97 stores or reads image data to or from the page memory 98. The page memory 98 has an area in which image data corresponding to a plurality of pages can be stored, and is formed

20   so as to be capable of storing data obtained by compressing the image data from the scanner portion 4 in accordance with one page.

Further, a compression portion 87 for compressing image data is connected to the page memory

25   controller 97.

Font data corresponding to print data is stored in the printer font ROM 121.

The printer controller 99 develops the print data from an external device 122 such as a personal computer into image data by using the font data stored in the printer font ROM 121 with a resolution according to data representing a resolution given to that print data.

The scanner portion 4 is constituted by: the scanner CPU 100 for controlling the entire scanner portion 4; a ROM 101 in which a control program and others are stored; a RAM 102 for storing data; a CCD driver 103 for driving the CCD sensor 34; a scan motor driver 104 for controlling the exposure lamp 25 and the rotation of a motor for moving the mirrors 26, 27 and 28 and others; an A/D conversion circuit for converting an analog signal from the CCD sensor 34 into a digital signal; a shading correction circuit for correcting fluctuations of a threshold level relative to an output signal from the CCD sensor 34 which are caused due to irregularities of the CCD sensor 34 or a change in the ambient air temperature; and an image correction portion 105 consisting of a line memory for temporarily storing a shading-corrected digital signal from the shading correction circuit.

The printer portion 6 is constituted by: a printer CPU 110 for controlling the entire printer portion 6; a ROM 111 in which a control program and others are stored; a RAM 112 for storing data; a laser driver

113 for turning on/off the light emission by the
semiconductor laser 41; a polygon motor driver (motor
controller) 114 for controlling the rotation of the
polygon motor 37 of the laser unit 40; a paper carrying
portion 115 for controlling carriage of the paper P
by the carrying path 58; an electrostatic charger 45;
a developer 46; a development process portion 116 for
performing electrostatic charge, development and
transfer by using the transfer charger 48; a fixer
control portion 117 for controlling the fixer 60; and
an option portion 118.

Furthermore, the image processing portion 96, the
page memory 98, the printer controller 99, the image
correction portion 105, and the laser driver 113 are
connected by an image data bus 120.

FIG. 3 shows the structure of a primary portion
according to the present invention in the main control
portion 90. That is, the ROM 92 in which a control
program is stored and the page memory controller 97 are
connected to the main CPU 91, and the compressor 87 and
the page memory 98 are connected to the page memory
controller 97.

The page memory 98 is controlled by the page
memory controller 97 and has an image data storage
area 131, a code data storage area 132 and a rotation
buffer 133.

FIG. 4 shows the procedure for creating code data

from image data stored in the page memory 98. The
image data stored in the image data storage area 131 of
the page memory 98 is subjected to rotation processing
and compression processing in accordance with each

5   block.

The image data which has been subjected to the
rotation processing is stored in the rotation buffer
133, and then subjected to the compression processing
and written into the code data storage area 132.

10   If all the pixels in the image data are white
(white block), the rotation processing is omitted and
the compression processing is effected. The code data
obtained after the compression processing is written in
the code data storage area 132.

15   Next, a description will be given as to how blocks
(1) to (5) in the image data shown in FIG. 4 become
code data. It is assumed that all the pixels in the
block (1) and the block (3) are white (white blocks)
and not all the pixels in the block (2), the block (4)

20   and the block (5) are white (non-white blocks).

It is to be noted that compression in this
embodiment is MMR compression (compression using
a Modified Modified READ Code). The MMR compression
adopts a two-dimensional line unit coding system.

25   A change point is determined by making reference to
a line to be coded and an immediately preceding line,
and coding is carried out based on the change point.

As a reference line for a first coded line in a page,
a white line is virtually presupposed. Moreover, as
a reference line of a non-white block following a white
block, a virtual white line is presupposed as being
similar to the first line in the page.

Since the block (1) is a white block, the rotation
processing is omitted and the compression processing
is carried out. The code data after compression is
written in the code data storage area 132. Since the
reference line is the first line in the page, it is
a virtual white line.

Since the block (2) is a non-white block, the
compression processing of the image data is executed
after performing the rotation processing. The code
data after compression is written in the code data
storage area 132. It is to be noted that the reference
line of the block (2) is a virtual white line since
the immediately preceding block is a white block.

Since the block (3) is a white block, the rotation
processing is omitted and the compression processing is
effected. The code data after compression is written
in the code data storage area 132. It is to be noted
that the reference line of the block (3) is a last line
of the block (2) since the immediately preceding block
of the block (3) is a non-white block.

Since the block (4) is a non-white block, the
compression processing of the image data is carried out

after performing the rotation processing. The code
data after compression is written in the code data
storage area 132. The reference line of the block (4)
is a virtual white line since its immediately preceding

5   block is a white block.

Since the block (5) is a non-white block, the
compression processing of the image data is carried out
after performing the rotation processing. The code
data after compression is written in the code data

10   storage area 132. The reference line of the block (5)
is a last line of the block (4) since the immediately
preceding block of the block (5) is a non-white block.

FIG. 5 illustrates the rotation processing.
A rotation angle in this embodiment is determined as

15   the rotation of 270 degrees in the clockwise direction.
Further, in this embodiment, 32 bits $\times$ 32 bits are
determined as one cell, and 32 bits $\times$ (32 $\times$ n) bits of
the image data are determined as one block. It is to
be noted that n is an integer. The rotation processing

20   is carried out in accordance with each cell
constituting a block.

The operation of the rotation processing and the
compression processing in this structure will now be
described with reference to the flowchart of FIG. 6.

25   The page memory controller 97 first makes judgment
upon whether the processing of all the blocks of the
image data stored in the image data storage area 131 of

the page memory 98 is completed (ST 501).

If it is not completed, the page memory controller 97 calculates a position of a block to be processed (ST 502). Subsequently, the page memory controller 97 makes judgment (bit retrieval) upon whether that block of the image data stored in the image data storage area 131 is a white block (ST 503).

If that block is a non-white block, the page memory controller 97 performs the rotation processing of that block and stores the obtained result in the rotation buffer 133 (ST 504). Furthermore, the page memory controller 97 sets the immediately preceding line of that block in the compressor 87 as a reference line (ST 505). The page memory controller 97 bit-retrieves the image data of that block stored in the rotation buffer 133 and controls the compression processing by the compressor 87 (ST 507). Moreover, the page memory controller 97 stores the code data of that block which has been subjected to the compression processing in the code data storage area 132 of the page memory 98.

In addition, if it was found that the block is a white block by the judgment at the step ST 501, the page memory controller 97 omits the rotation processing and sets a virtual white line in the compressor 87 as a reference line (ST 506). By omitting the rotation processing in this manner, the operation for storing

in the rotation buffer 133 and the bit retrieval when
reading from the rotation buffer 133 are omitted.
The page memory controller 97 controls to carry out the
compression processing of the image data of that block
5   by the compressor 87 (ST 507). Then, the page memory
controller 97 stores the code data of that block which
has been subjected to the compression processing in the
code data storage area 132.

Upon completing the step ST 507, the page memory
10   controller 97 returns to the step ST 501 and repeats
the processing of the steps ST 501 to 507 until the
processing of all the blocks of the image data stored
in the image data storage area 131 of the page memory
98 is terminated.

15   The operation of the rotation processing in a
non-white block at the step ST 504 will now be
described with reference to the flowchart of FIG. 7.

The page memory controller 97 first makes judgment
upon whether the processing of all the cells in that
20   block is completed (ST 601).

If it is not completed, the page memory controller
97 carries out the rotation processing of cells which
are yet to be processed (ST 602), and calculates
a position of a next cell (ST 603).

25   When the step ST 603 is completed, the page memory
controller 97 returns to the step ST 601 and repeats
the processing of the steps ST 601 to 603 until the

rotation processing of all the cells of that block is terminated.

FIG. 8 shows a flow of the image data in the case of the above-described non-white block. The image data stored in the image data storage area 131 of the page memory 98 is rotated and stored in the rotation buffer 133 by the page memory controller 97 (ST 1). Subsequently, the image data which is stored in the rotation buffer 133 and has been subjected to the rotation processing is compressed by the compressor 87 under control of the page memory controller 97 (ST 2), and stored in the code data storage area 132 as the code data (ST 3).

FIG. 9 shows a flow of the image data in case of the above-described white block. The image data stored in the image data storage area 131 of the page memory 98 is compressed by the compressor 87 under control of the page memory controller 97 (ST 11), and stored in the code data storage area 132 as the code data (ST 12).

As described above, according to the embodiment of the present invention, as to the basic operations, i.e., rotation and compression of the image data, the rotation processing is carried out in units of n pixels × n pixels, and the compression processing is effected with respect to that image data. However, in the present invention, it is good enough to perform the bit

retrieval for the white line only once by omitting the rotation processing, and the speed of the rotation and compression processing can be increased.

In the above-described embodiment, it is to be noted that the rotation processing is executed by software in the page memory controller but a rotation processing portion may be provided as means for executing the rotation processing by hardware.